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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/636,181	08/07/2003	Andrei Mihnea	400.237US01	1762
27073	7590	12/14/2005	EXAMINER	
LEFFERT JAY & POLGLAZE, P.A.			PHAM, LY D	
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MINNEAPOLIS, MN 55458-1009			PAPER NUMBER	
			2827	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/636,181

Applicant(s)

MIHNEA ET AL.

Examiner

Ly D. Pham

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-14 is/are pending in the application.
- 4a) Of the above claim(s) 8-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Applicant's Request for Continued Examination, RCE, filed November 16, 2005 has been accepted and entered. Claims amendment filed November 01, 2005 has been entered. Claims 1, 5, 6, and 8 have been amended. Claims 2 and 15 – 21 have been canceled. Currently, claims 8 – 14 are withdrawn from consideration for being drawn to non-elected invention.

Response to Arguments

2. Applicant's arguments filed November 01, 2005 have been fully considered but they are not persuasive.

In view of the remarks, page 5, in which claim 1 has been amended to include the limitation that the NROM cells are with short channels less than 0.2 microns, however, according to applicant's own disclosure, under the same erase method as that in the prior arts, the memory cells appear to behave the same regardless of the difference of the cells' physical property, i.e. short-channel of less than 0.2 microns. Besides, since the claims in the instant application are drawn to method of erasure, which discloses a clear and obvious fact of a straight-forward technique of recovering over-erased cells (over-erased cells have lower threshold voltage, consequently, recovering those cells by bringing the threshold voltage up to a higher level), which is proven to be widely known in the arts (see references applied and cited for further

details). As a result, with careful re-consideration, the pending claims remain unpersuasive in view of the prior arts.

As per applicant's request for the withdrawal of the Restriction/Election Requirement, currently, due to reason as provided in the office action mailed on June 09, 2005, the restriction/election requirement is maintained and deemed final.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (US Pat 5,909,392).

Regarding **claims 1, 5, and 6**, Chang et al. disclose a method for erasing a non-volatile PMOS floating gate memory cells block comprising a plurality of memory cells each having a gate input and two source/drain regions, the method comprising:

erasing the memory block (col. 7, lines 41 – 53, "page mode erase" erases a block of cells in an entire row); and

performing a recovery operation on the plurality of memory cells (abstract, soft-programming mechanism is used to compensate for over-erasing of the memory cells, and col. 8, lines 18 – 29, "Preferably, this soft-program operation is performed immediately after completion of an erasing operation") such that a threshold voltage

indicating a programmed state, for over-erased cells, is increased (col. 7, lines 54 – 62, “it is necessary to return the threshold voltages V_T of the over-erased cells to between – 1.5 and –2.0 volts” from a voltage more negative than –2 volts) by coupling the gate input to a ramped voltage (col. 8, lines 13 – 17), a first source/drain region to a first constant voltage (see figs. 2 and 3, and col. 7, line 66 – col. 8, line 13. “..., couples the p+ source 36 of the selected cell 30a(1) to the well potential line WP0, i.e., to **approximately 9 volts—first constant voltage**. Note that from fig. 2, the p+ source 36 is the bottom source/drain region of a memory cell in fig. 3, particularly in this instance, memory cell 30a(1)), and the remaining source/drain region to a second constant voltage (since the select gate line SG0 is grounded, which turns on the string select transistor 64a on, which then couples the bit line BL0 potential, held at between 0 – 2 volts to soft program cell 30a(1), to the top source/drain region of cell 30a(1) to some constant voltage near **between 0 – 2 volts—second constant voltage**).

Although Chang et al. did not clearly specify the erasing method for a nitride read only memory (NROM) block, however, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to utilize such method for the similar memory cell type, as NROM might be the case being provided for the purpose of reducing power consumption (col. 8, lines 39 – 47).

Further, though Chan et al. did not clearly specify the memory cells being of short-channel having channel length less than 0.2 microns, however, it has been held that to be entitled to weight in method claims, the recited-structure limitations therein

must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. *Ex Parte Pfeiffer*, 1962 C.C. 408 (1961).

Furthermore, due to no clear specification as to why the channel range is considered critical to the disclosure (see paragraph 0022), it would have been obvious to one of ordinary skill in the art, at the time the invention was made to arrive at the NROM cells having the disclosed short-channel length of less than 0.2 microns since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

5. Claim 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (US Pat 5,909,392) in view of Chung (US Pat Pub 2004/0185619 A1).

Regarding **claim 7**, though Chang et al. did not further teach the method of claim 1, wherein the NROM block be embedded in a CMOS device, the feature is however taught by Chung (paragraph 0008, lines 1 – 3). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine the feature taught by Chung to the disclosure by Chang et al., to allow for further minimization of device size and increased device density without degradation in performance (paragraph 0008, lines 3 – 14).

6. Claims 1, 5 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu et al. (US Pat 6,598,752 B1) in view of Chung (US Pat Pub 2004/0185619 A1).

Regarding **claims 1, 5, and 6**, Hsu et al. disclose a method for erasing a nonvolatile NOR type EEPROM memory comprising:

erasing the memory block (fig. 4A, or abstract);

performing a recovery operation on the plurality of memory cells such that a threshold voltage indicating a programmed state for over-erased cells is increased (col. 7, lines 35 – 42, fig. 8 shows increasing threshold voltage V_t of over-erased cells at each .5V step) by coupling the gate input to a ramped voltage (step-ramped control gate voltage V_g), a first source/drain region to a first constant voltage (drain voltage set to 4.5 or 5 Volts, which is in a range of 3 – 7 volts), and the other source/drain region to a second constant voltage (col. 7, lines 18 – 19, “In the selected block 0, the source lines $SL(0)$ is set to 0 Volt...”. According to fig. 5, the source line $SL(0)$ is connected to the other source/drain region of the memory cell, which means the second constant voltage is in the range of 0 – 3 volts).

Although Hsu et al. did not clearly show the erasing method for a nitride read only memory (NROM) block, however, advantages of application of nonvolatile NROM has been taught by Chung (paragraph 0006). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to incorporate the feature taught by Chung to the disclosure by Hsu et al., so that the ONO structure may be used to replace the gate dielectric used in floating gate devices (paragraphs 0007 and 0009).

Additionally, though Hsu et al. did not clearly specify the memory cells being of short-channel having channel length less than 0.2 microns, however, it has been held

that to be entitled to weight in method claims, the recited-structure limitations therein must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. *Ex Parte Pfeiffer*, 1962 C.C. 408 (1961).

Furthermore, due to no clear specification as to why the channel range is considered critical to the disclosure (see paragraph 0022), it would have been obvious to one of ordinary skill in the art, at the time the invention was made to arrive at the NROM cells having the disclosed short-channel length of less than 0.2 microns since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

As per **claim 7**, although Hsu et al. did not clearly show the method of claim 1, wherein the NROM is embedded in a CMOS device, the feature is however taught by Chung (paragraph 0008). Therefore, it is considered obvious to one of ordinary skill in the art, at the time the invention was made, to manufacture the memory cell using CMOS processes for embedded applications (paragraph 0009).

7. Claims 1 – 4, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haddad et al. (US Pat 6,172,909 B1) in view of Chung (US Pat Pub 2004/0185619 A1).

Regarding **claims 1 and 2**, Haddad et al. disclose a method for erasing a EEPROM block comprising a plurality of memory cells (fig. 1A) each having a gate input (fig. 1, gates connected to word lines) and two source/drain regions (fig. 1, one

connected to the source line to the power source 106, and the other connected to bit line to bit line driver 102), the method comprising:

erasing the memory block (col. 3, lines 7 – 19); and

performing a recovery operation after erasing the memory block of the plurality of memory cells such that a threshold voltage indicating a programmed state, for over-erased cells, is increased (abstract: soft programming for over-erased cells..., and col. 5, lines 25 – 40), the recovery operation includes biasing each of the plurality of memory cells with a ramped voltage on the gate input (col. 5, lines 41 – 45), a constant voltage on a first source/drain region and the remaining source/drain to a second constant voltage (abstract).

Although Haddad et al. did not clearly refer the EEPROM block as a NROM, as claimed in claim 1, however, the feature has been shown by Chung (paragraph 0010). Therefore, it is considered obvious to one of ordinary skill in the art, at the time the invention was made, to utilize the NROM in corporation with the disclosure by Haddad et al. for the advantages disclosed by Chung (paragraphs 0006 – 0009).

Further, though Haddad et al. did not clearly specify the memory cells being of short-channel having channel length less than 0.2 microns, however, it has been held that to be entitle to weight in method claims, the recited-structure limitations therein must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. *Ex Parte Pfeiffer*, 1962 C.C. 408 (1961).

Also, due to no clear specification as to why the channel range is considered critical to the disclosure (paragraph 0022), it would have been obvious to one of

ordinary skill in the art, at the time the invention was made to arrive at the NROM cells having the disclosed short-channel length of less than 0.2 microns since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding **claim 3**, Haddad et al. also disclose the method of claim 1, wherein the ramped voltage applies to the gate Is in a range of 0V to 3V (abstract: $V_{gs} < 3V$).

Regarding **claim 4**, Haddad et al. also disclose the method of claim 1, wherein the ramp voltage has a time period in a range of 10us to 1sec from start to end (col. 10, lines 44 – 47, ‘... <200msec in addition to the typical 0.5 to 1.0 second erase time per sector’).

As per **claim 7**, although Haddad et al. did not clearly show the method of claim 1, wherein the NROM is embedded in a CMOS device, the feature is however taught by Chung (paragraph 0008). Therefore, it is considered obvious to one of ordinary skill in the art, at the time the invention was made, to manufacture the memory cell using CMOS processes for embedded applications (paragraph 0009).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure (see cited US Pat 6,885,060 B2, col. 1, line 64 – col. 2, line 4, in which Nomoto et al. disclose memory cells having short-channel effect when gate length is 0.1um or shorter. However, this clearly yields the possibility of providing

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memory cells having channel length less than $0.2\mu\text{m}$ and greater than $0.1\mu\text{m}$, which is within the scope of the invention).


9. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned (see MPEP 710.02(b)).

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ly D. Pham whose telephone number is 571-272-1793. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ly D. Pham 
November 25, 2005


AMIR ZARABIAN
TECHNICAL EXAMINER
NOV 25 2005